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Acetylcholinesterase sensor based on screen-printed carbon electrode modified with prussian blue

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Abstract

Acetylcholinesterase (ChE) sensor based on Prussian blue (PB) modified electrode was developed and tested for the detection of organophosphorus and carbamic pesticides. The signal of the sensor was generated in PB mediated oxidation of thiocholine recorded at+200 mv in DC mode. ChE from electric eel was immobilized by cross-linking with glutaraldehyde in the presence of bovine serum albumin (BSA) on the surface of screen-printed carbon electrode covered with PB and Nafion. The content of the surface layer (specific enzyme activity, Nafion and BSA amounts) was optimized to establish high and reliable response toward the substrate and ChE inhibitors. The ChE/PB sensor makes it possible to detect Aldicarb, Paraoxon and Parathion-Methyl with limits of detection 30, 10 and 5 ppb, respectively (incubation 10 min). The feasibility of practical application of the ChE/PB sensor developed for the monitoring of degradation of the pesticides in wine fermentation was shown. To diminish matrix interferences, the electrolysis of the grape juice with Al anode and evaporation of ethanol were suggested, however the procedures decrease the sensitivity of pesticide detection and stability of the sample tested. © Springer-Verlag 2005.

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Keywords

Biosensor, Cholinesterase sensor, Pesticide detection, Prussian Blue, Wine contamination